

# Mathematics

Prepared by Dr. Israa Lewaa

## Lecture 10

جامعة الجميع الذكية

تسعى لتكون الكيان الأول الذي يتبنى مبدأ المجتمع التعليمي  
التعاوني ويقدم العلم مقابل العمل لتنمية وبناء المجتمعات.

MAT 112  
Math by Python



جامعة الجميع الذكية  
EVERYONE'S SMART UNIVERSITY

Study how to download python

Learn how to run different codes with Python for factorization

Learn how to run different codes with Python for graphing functions

Learn how to run different codes with Python for solving limits

Learn how to run different codes with Python for differential

Learn how to run different codes with Python for Integration

- 1- Download Python
- 2- Python for factorization
- 3- Python for graphing functions
- 4- Python for solving limits
- 5- Python for differential
- 6- Python for Integration

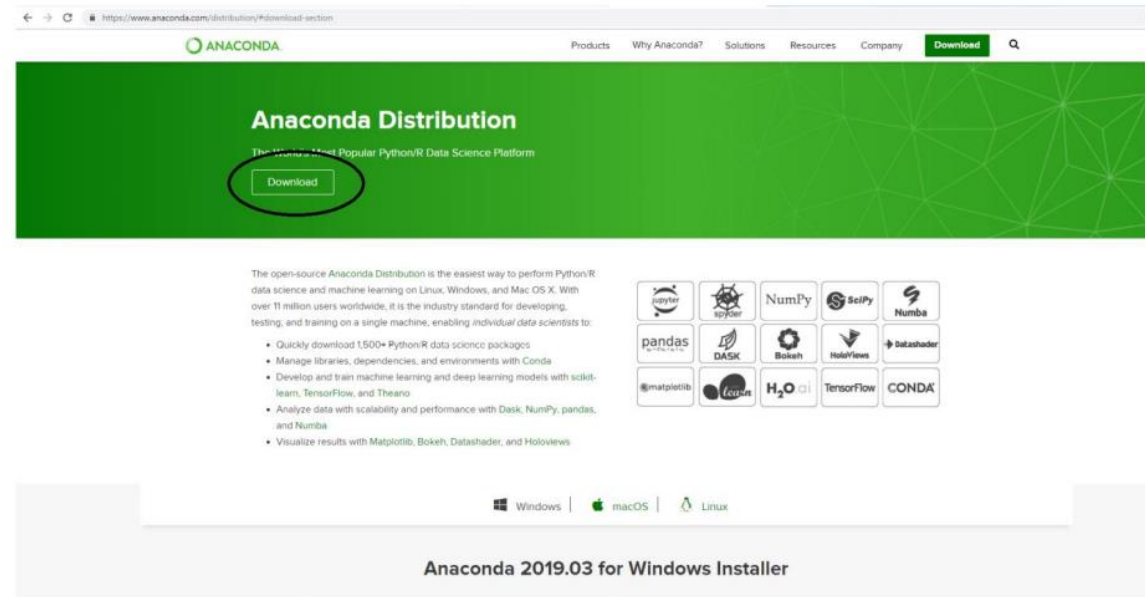
we will show how to install Python on your system. The Python is free of cost

(<https://www.anaconda.com/distribution/>)

## Step 1 – Download Python

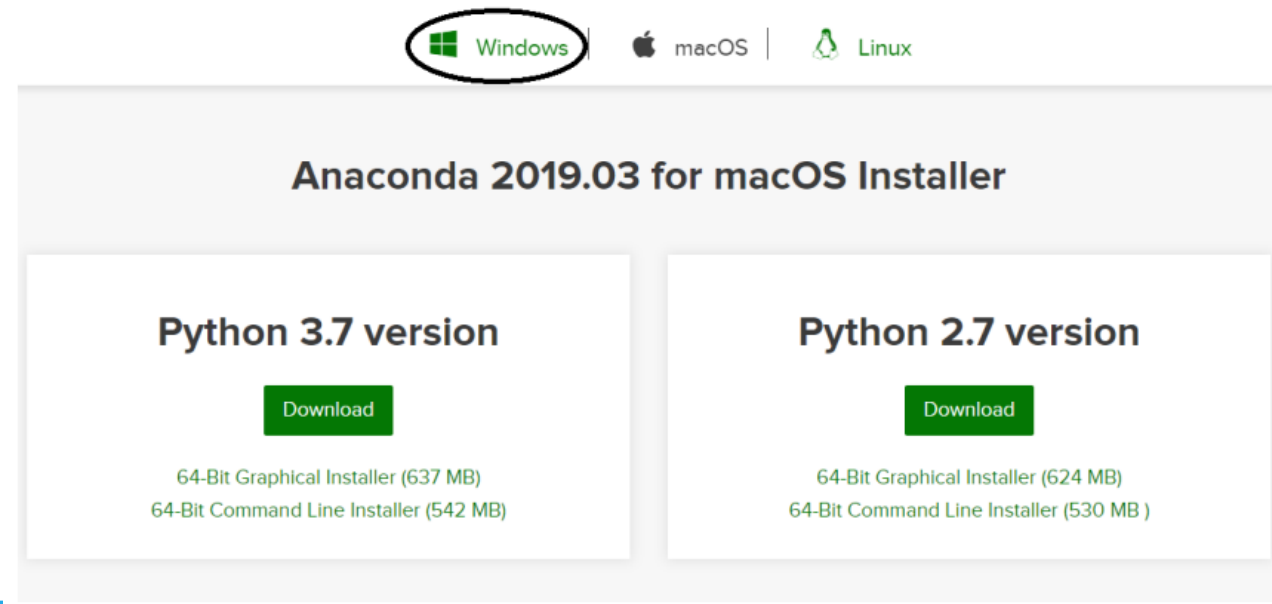
### Step 1:

Open your browser and go to Anaconda website (<https://www.anaconda.com/distribution/>) to download and install Anaconda. You will see a page like this. Click on download.



### Step 2:

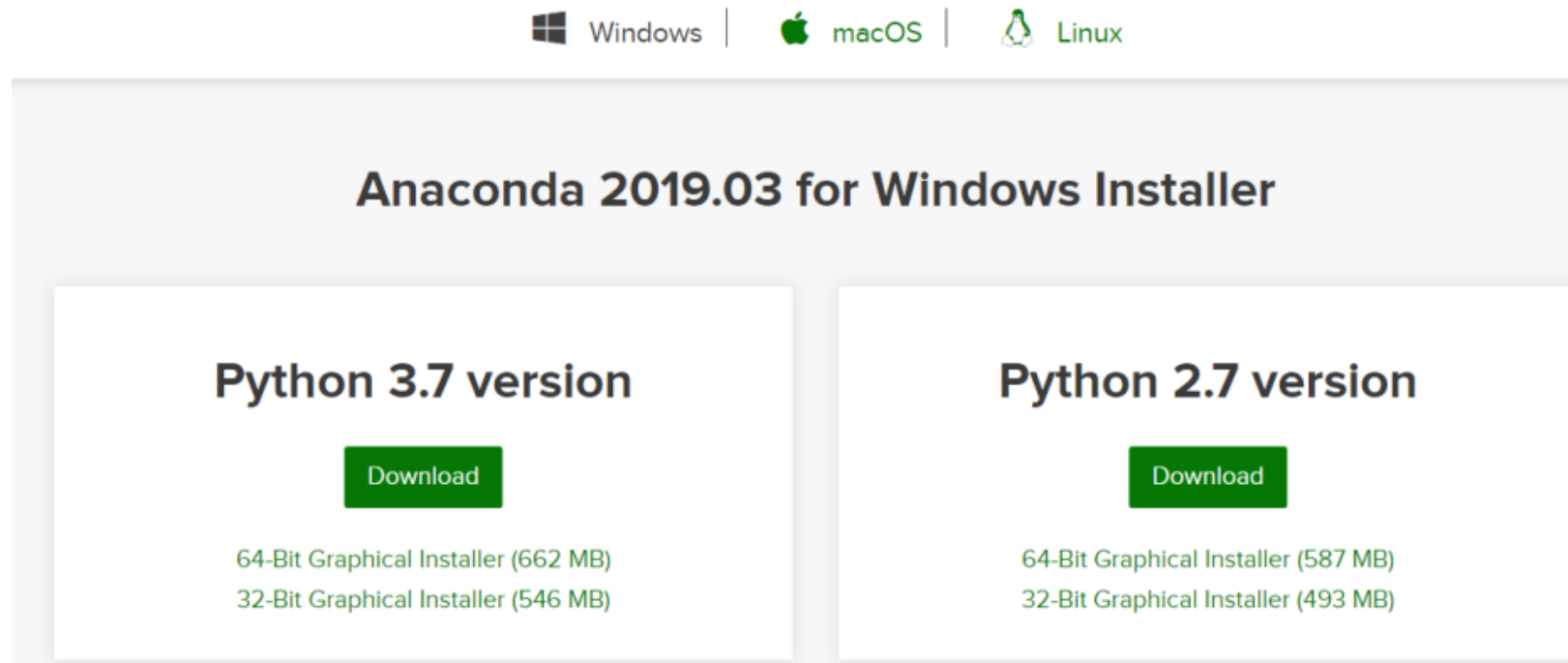
You will see that following page appears. By default, Anaconda shows you the download link for Mac operating system. If you have Mac, then you can click “64-Bit Graphical Installer” under Python 3.7 version to start downloading the file. In this computer, Windows is the operating system, so we will select Windows as shown below. If you have Linux as operating system, then you can select Linux option and download file in similar manner as Mac. Mac and Linux users can skip Step 3 & 4



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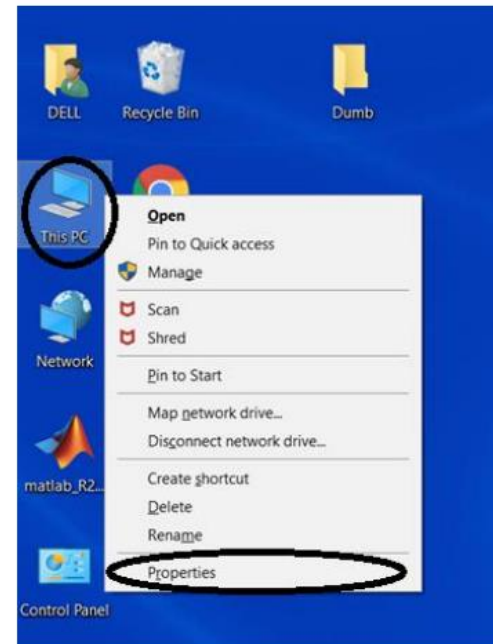
## Step 2 Con'd – Download Python

After clicking on Windows button, the following page will appear.



### Step 3:

You can see that there are two options for Windows: 64-Bit and 32-Bit. You need to find out whether your system is 64-Bit or 32-Bit and accordingly you need to select the file for your system. To do so, go to your desktop home screen, right click on 'Computer' icon, then select Properties.



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## Step 3 Con'd – Download Python

This will show you basic information about your system. Look for “System Type” as shown below and check whether it is 64-bit or 32-bit. For this computer, we see that Windows system type is 64 -bit.

### View basic information about your computer

#### Windows edition

Windows 10 Home Single Language

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#### System

Processor: Intel(R) Core(TM) i5-7200U CPU @ 2.50GHz 2.70 GHz

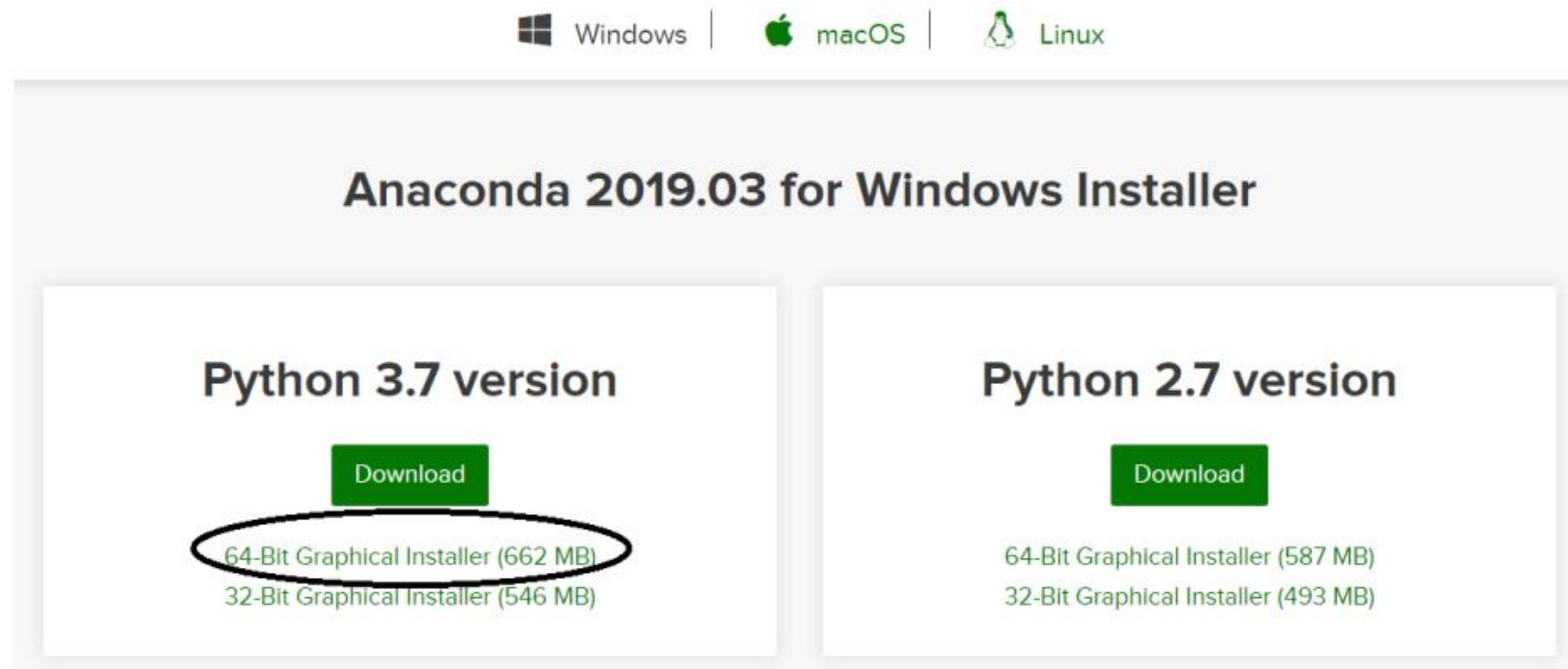
Installed memory (RAM): 8.00 GB

System type: 64-bit Operating System, x64-based processor

Pen and Touch: No Pen or Touch Input is available for this Display

### Step 4:

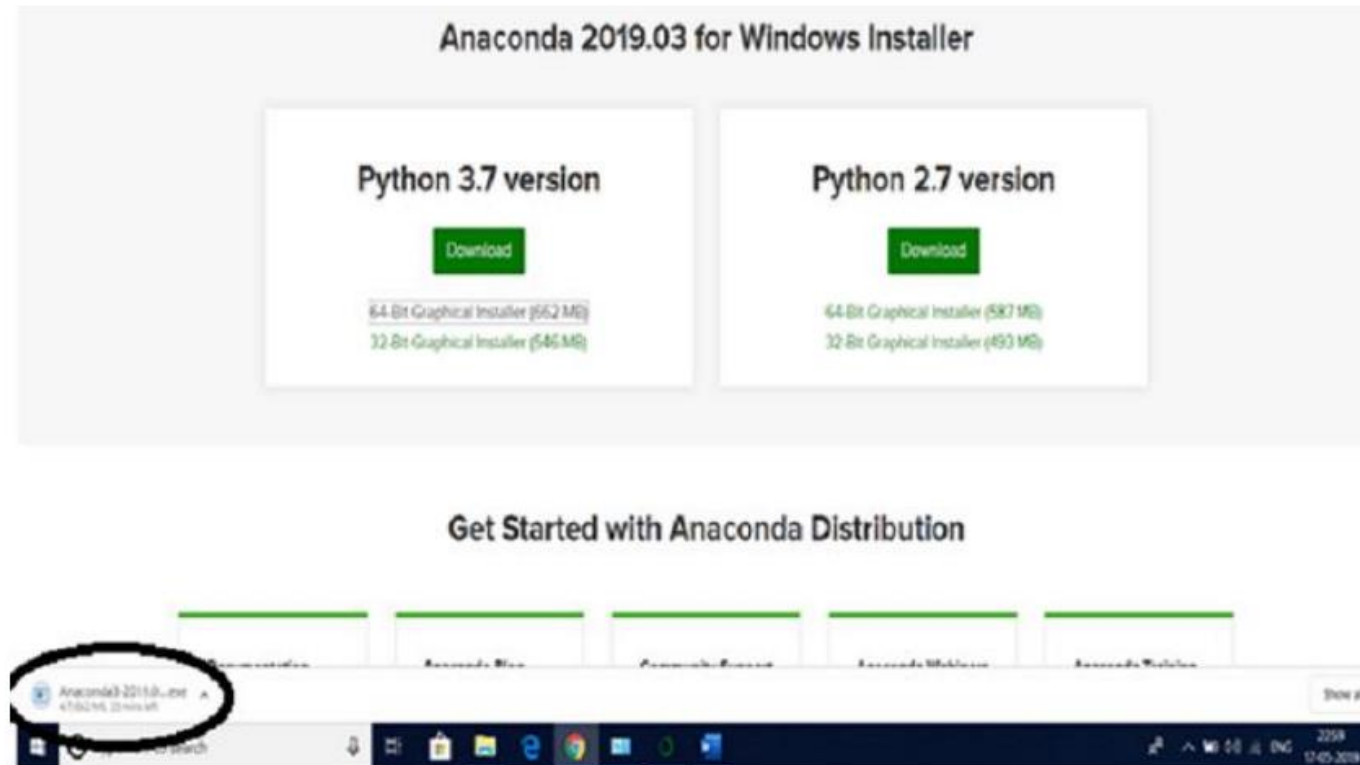
Now, go back to your browser and then click “64-Bit Graphical Installer (662 MB)” as this computer is 64 bit (as identified in Step 3)



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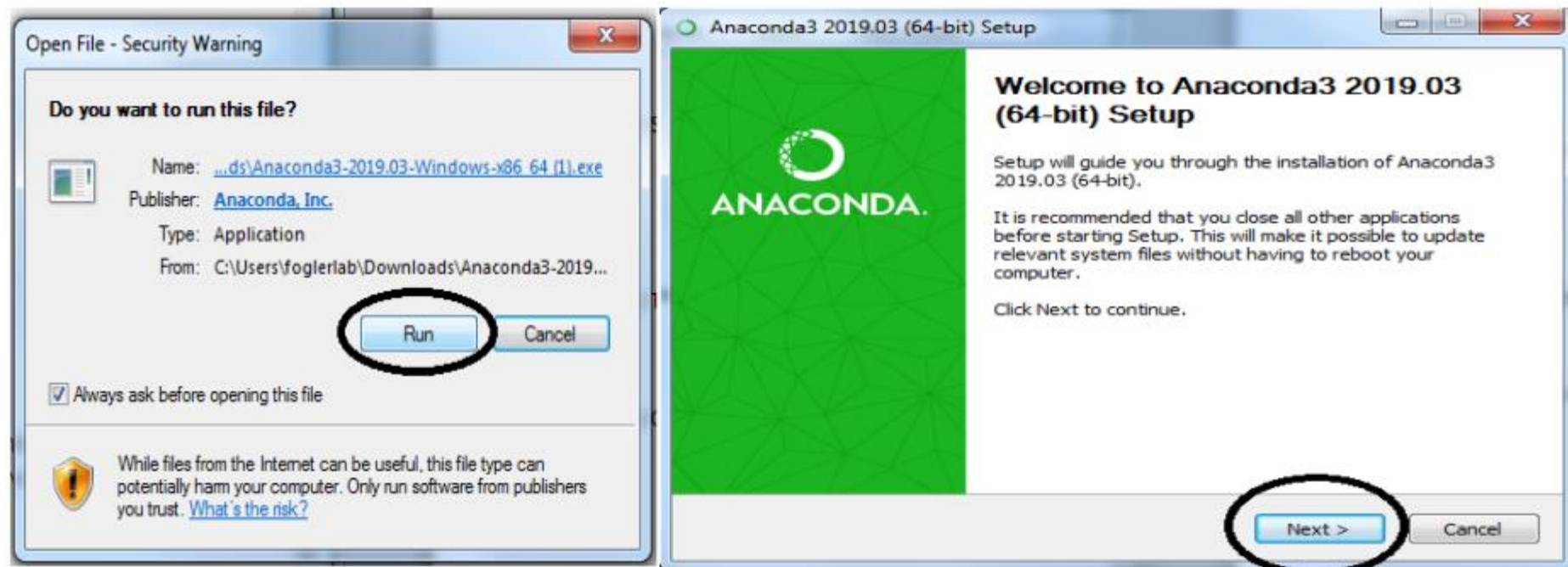
## Step 4 Con'd – Download Python

The installer will start downloading the file (this may take a while) and will appear in bottom left of your browser (if you are using google chrome) as shown below.



### Step 5:

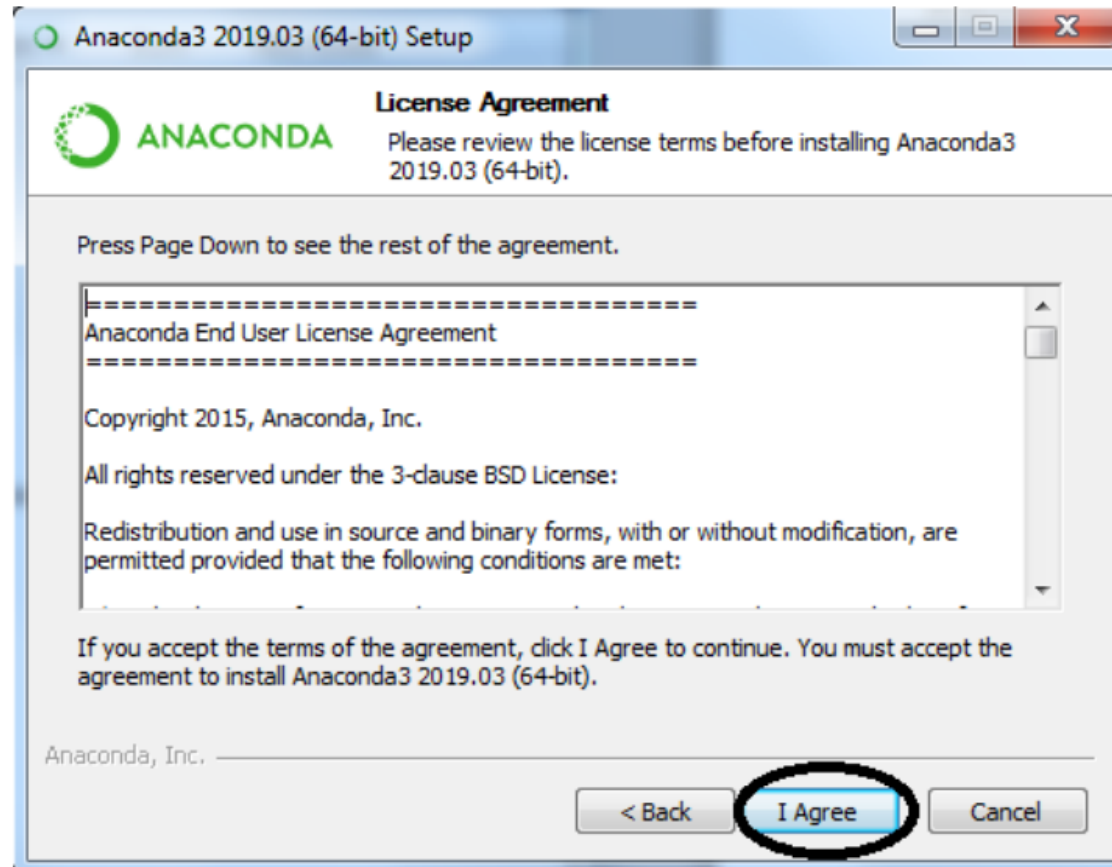
When the file is completely downloaded, click on the file. You will see that following window appears. Click on 'Run', and then click 'Next' button.



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## Step 5 con'd – Download Python

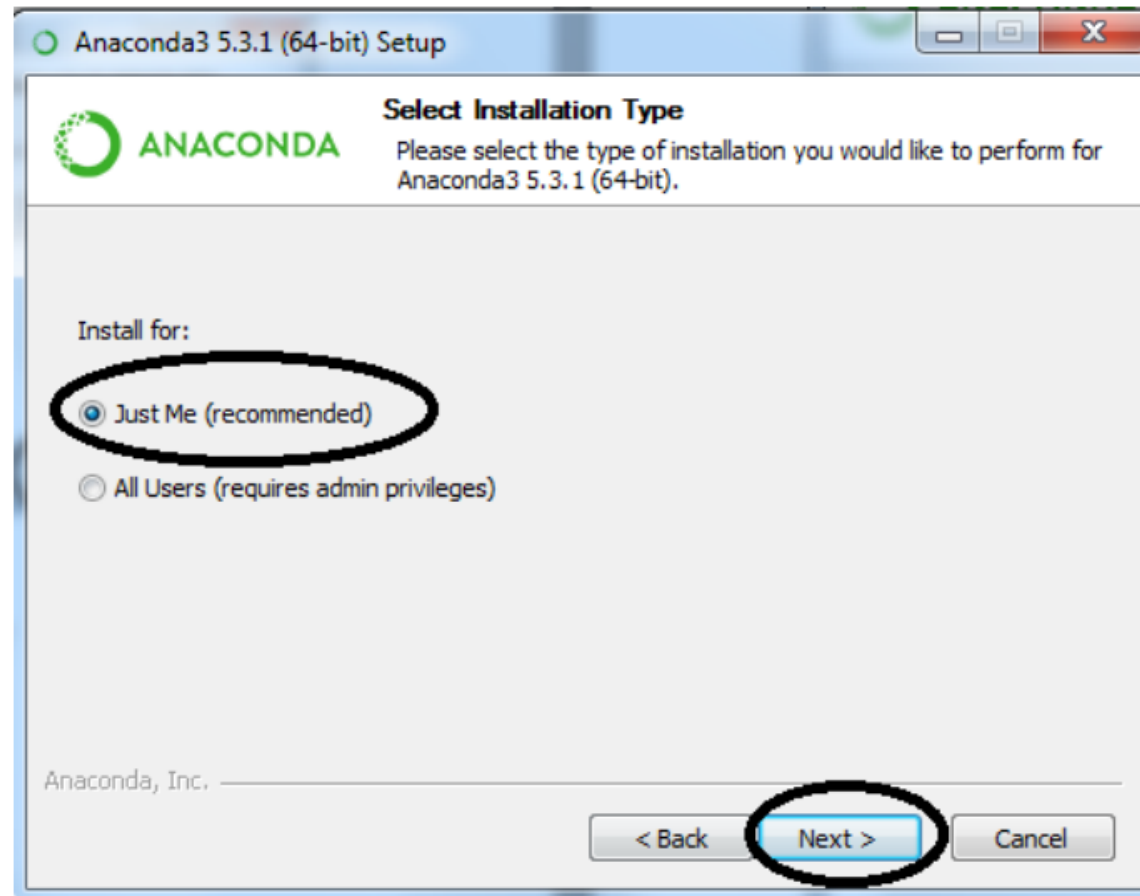
A new window will appear asking you to accept the terms of agreement, select “I Agree”



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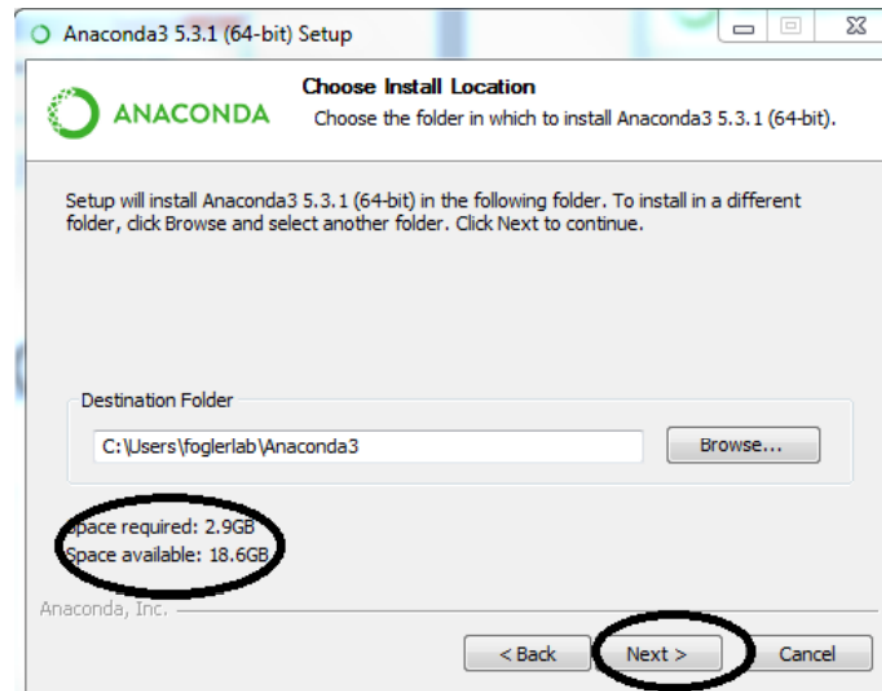
## Step 5 con'd – Download Python

Select 'Just Me' which is recommended and then click Next



### Step 6:

Make sure you have the required free space for software installation. which you can check as shown below. Then click Next. (If you don't have required space, then you need to delete some of your items to free the space)

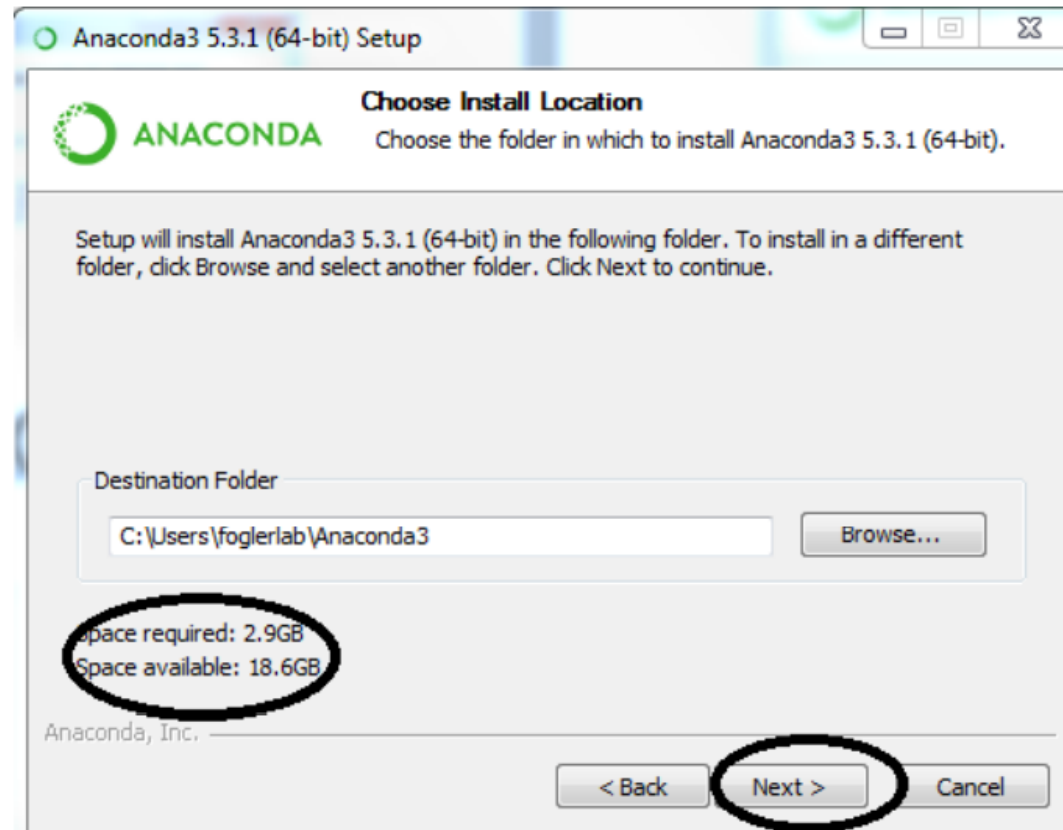


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## Step 7 – Download Python

### Step 7:

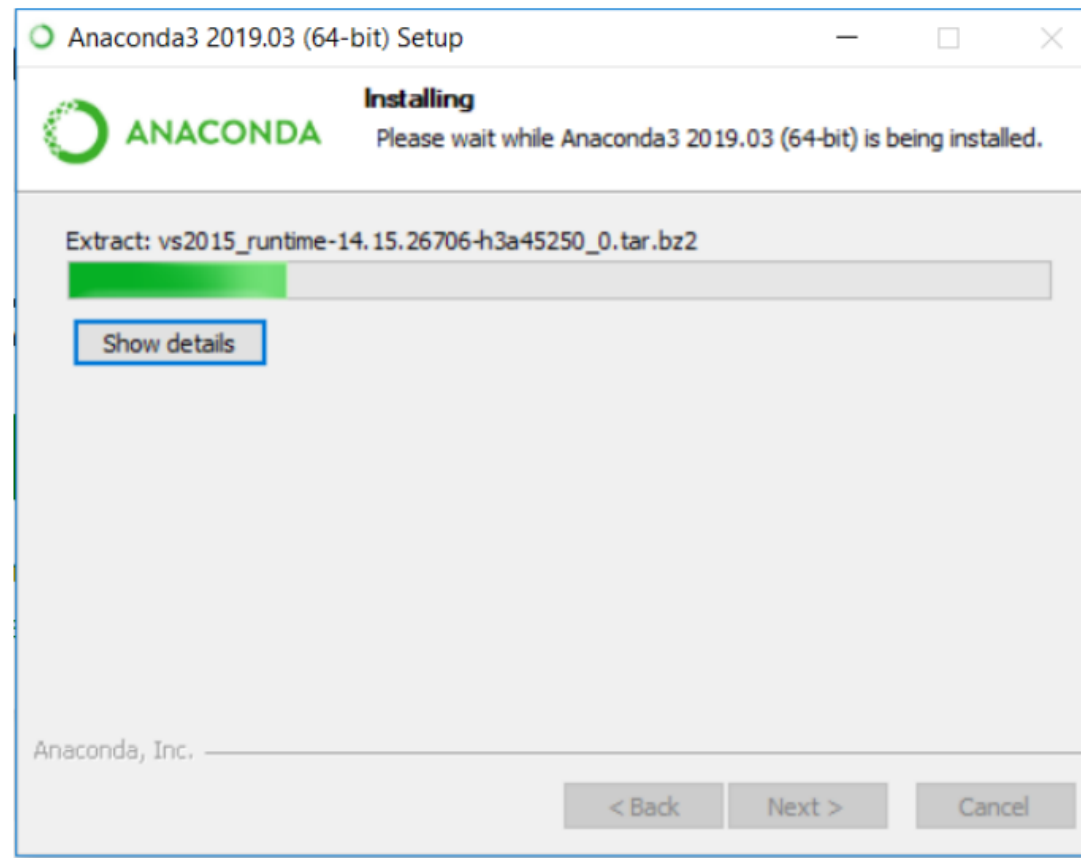
You will see that following window appears. Click on Install.



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## Step 7 con'd – Download Python

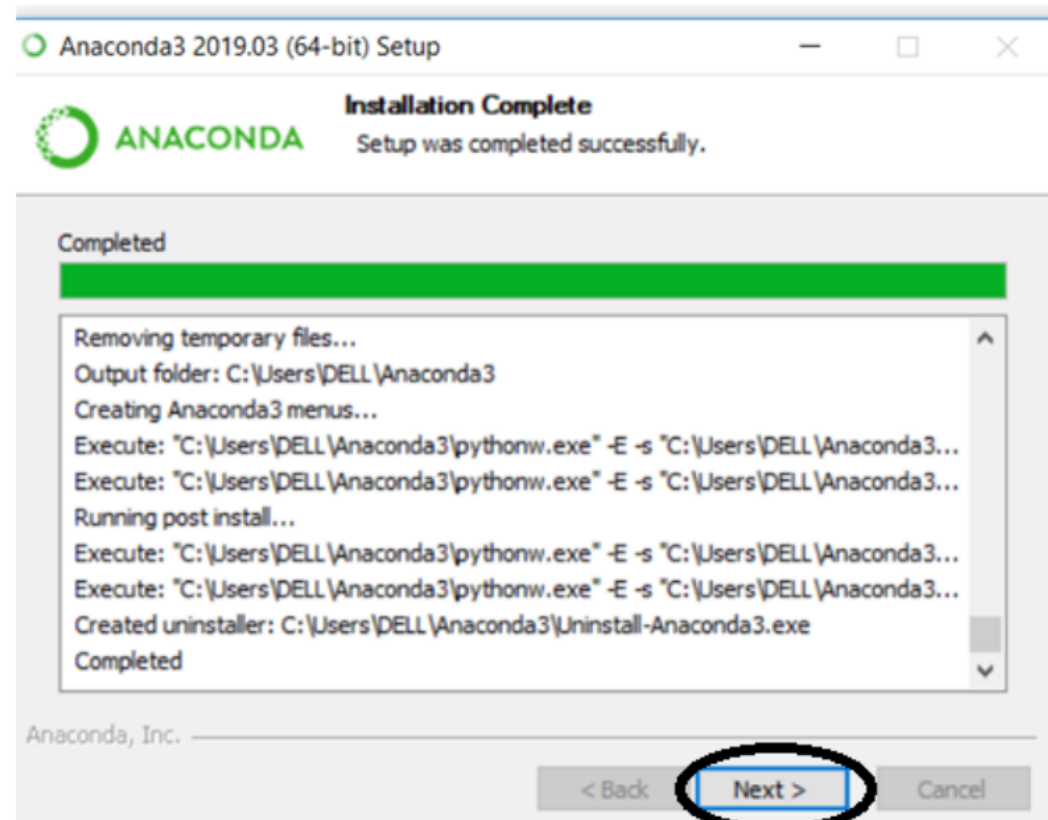
This will lead you to installation page showing the progress of installation. It will take some time for the software to get installed.



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## Step 7 con'd – Download Python

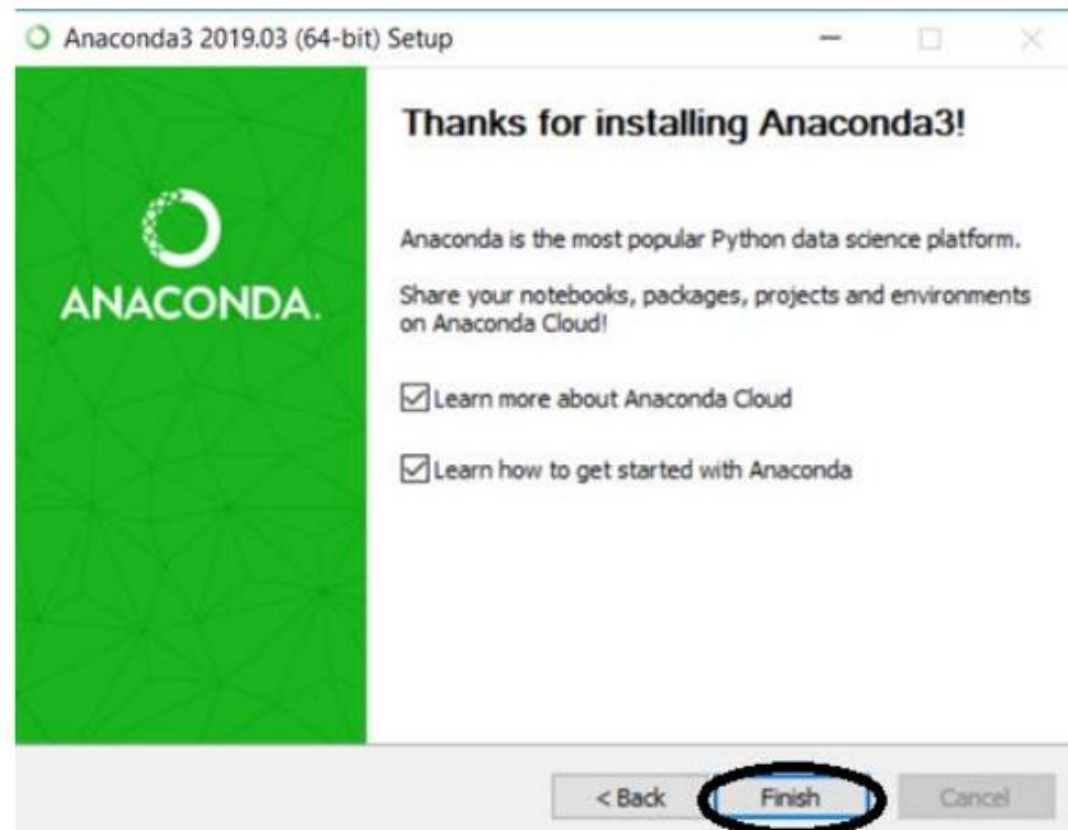
After all the files are extracted, the “Next” button will get enabled. Click on Next button



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## Step 7 con'd – Download Python

Then following window will appear. Click on Finish button to complete the installation. Now Anaconda has been installed on your computer.

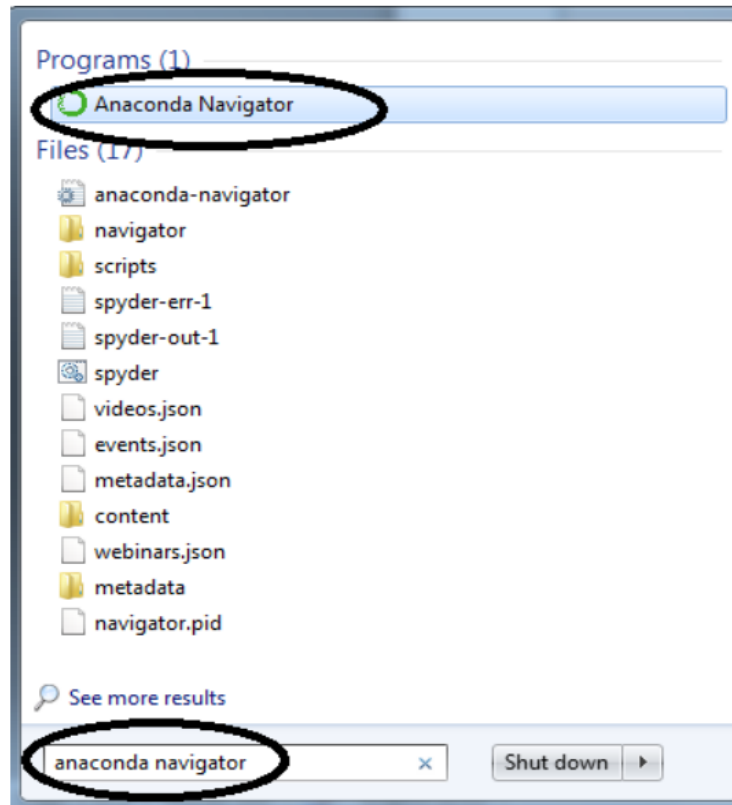


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## Step 8 – Download Python

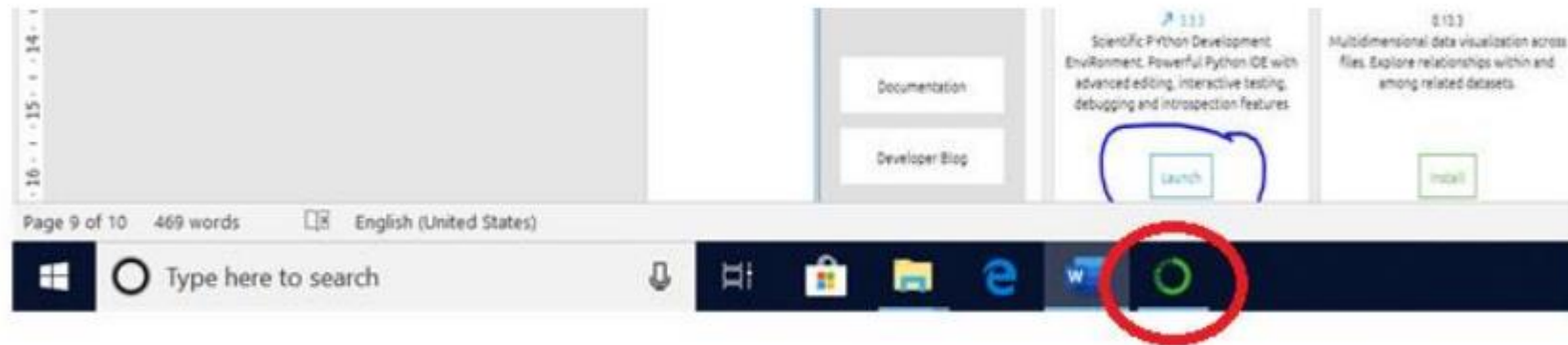
### Step 8:

Type 'anaconda navigator' in search box and click on the icon indicated below



### Step 9:

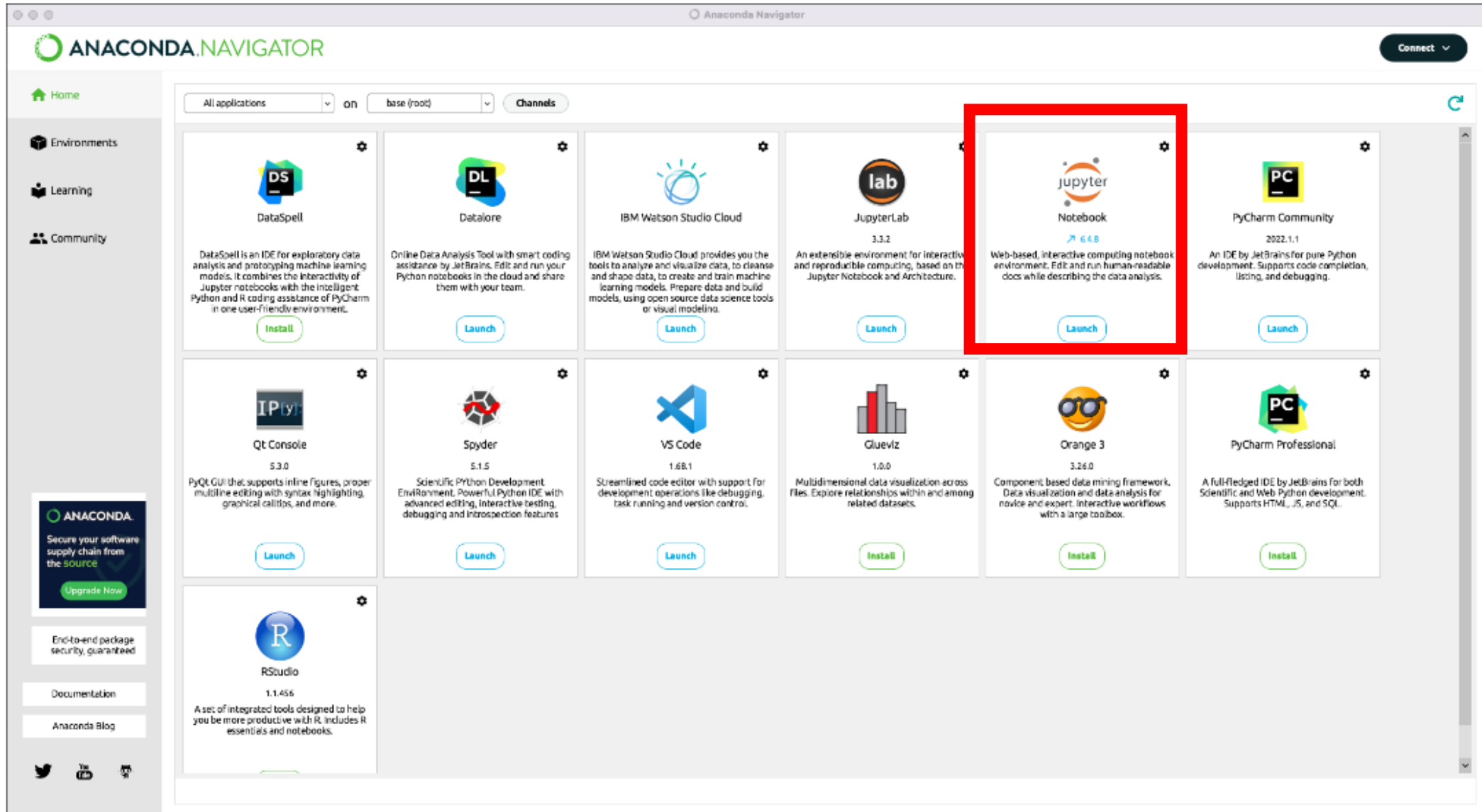
You will see that the Anaconda Navigator icon appears on the bottom toolbar. Click on the icon to see the contents of Navigator.



You will see that following page appears showing different options available which you can use.

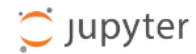
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## Example



# Lecture 10

## Jupyter Interface

[Quit](#)[Logout](#)[Files](#)[Running](#)[Clusters](#)[Nbextensions](#)

Select items to perform actions on them.

[Upload](#)[New ▾](#)

| <input type="checkbox"/> 0 ▾ | 📁 /                    | Name ▾ | Last Modified | File size |
|------------------------------|------------------------|--------|---------------|-----------|
| <input type="checkbox"/>     | 📁 ansel                |        | 3 months ago  |           |
| <input type="checkbox"/>     | 📁 Contacts             |        | 4 months ago  |           |
| <input type="checkbox"/>     | 📁 Creative Cloud Files |        | 16 hours ago  |           |
| <input type="checkbox"/>     | 📁 Desktop              |        | 17 hours ago  |           |
| <input type="checkbox"/>     | 📁 Documents            |        | 17 hours ago  |           |
| <input type="checkbox"/>     | 📁 Downloads            |        | 2 minutes ago |           |
| <input type="checkbox"/>     | 📁 Favorites            |        | 4 months ago  |           |
| <input type="checkbox"/>     | 📁 Links                |        | 4 months ago  |           |
| <input type="checkbox"/>     | 📁 Microsoft            |        | 4 months ago  |           |
| <input type="checkbox"/>     | 📁 Music                |        | 4 months ago  |           |



# Lecture 10

## Open new file in Jupyter



The screenshot shows the JupyterLab interface. At the top, there's a header with the Jupyter logo and 'Quit' and 'Logout' buttons. Below the header, there are tabs for 'Files', 'Running', 'Clusters', and 'Nbextensions'. The 'Files' tab is active, displaying a file browser. The text 'Select items to perform actions on them.' is shown. In the top right of the file browser, there are buttons for 'Upload', 'New' (circled in red), and a refresh icon. Below these buttons is a table of files and folders. The table has columns for 'Name', 'Last Modified', and 'File size'. The files listed are: '0', 'ansel', 'Contacts', 'Creative Cloud Files', 'Desktop', 'Documents', 'Downloads', 'Favorites', 'Links', and 'Microsoft'.

|                          | Name                 | Last Modified | File size |
|--------------------------|----------------------|---------------|-----------|
| <input type="checkbox"/> | 0                    |               |           |
| <input type="checkbox"/> | ansel                | 3 months ago  |           |
| <input type="checkbox"/> | Contacts             | 4 months ago  |           |
| <input type="checkbox"/> | Creative Cloud Files | 16 hours ago  |           |
| <input type="checkbox"/> | Desktop              | 17 hours ago  |           |
| <input type="checkbox"/> | Documents            | 17 hours ago  |           |
| <input type="checkbox"/> | Downloads            | 2 minutes ago |           |
| <input type="checkbox"/> | Favorites            | 4 months ago  |           |
| <input type="checkbox"/> | Links                | 4 months ago  |           |
| <input type="checkbox"/> | Microsoft            | 4 months ago  |           |

# Lecture 10

## Open new file in Jupyter

The screenshot displays the JupyterLab web interface. At the top, there's a header with the 'jupyter' logo and 'Quit' and 'Logout' buttons. Below the header, there are tabs for 'Files', 'Running', 'Clusters', and 'Nbextensions'. The 'Files' tab is active, showing a file browser. A red box highlights the 'New' button in the top right corner of the file browser. A dropdown menu is open from this button, showing options: 'Python 3 (ipykernel)', 'Text File', 'Folder', and 'Terminal'. The 'Python 3 (ipykernel)' option is highlighted. Below the file browser, there's a table of files and folders. The table has columns for 'Name', 'Size', and 'Created'. The files listed are: 'ansel', 'Contacts', 'Creative Cloud Files', 'Desktop', 'Documents', 'Downloads', 'Favorites', 'Links', 'Microsoft', and 'Music'. The 'Created' column shows timestamps: '17 hours ago', '7 minutes ago', '4 months ago', '4 months ago', '4 months ago', and '4 months ago'.

jupyter

Quit Logout

Files Running Clusters Nbextensions

Select items to perform actions on them.

0 /

Python 3 (ipykernel)

Text File

Folder

Terminal

17 hours ago

7 minutes ago

4 months ago

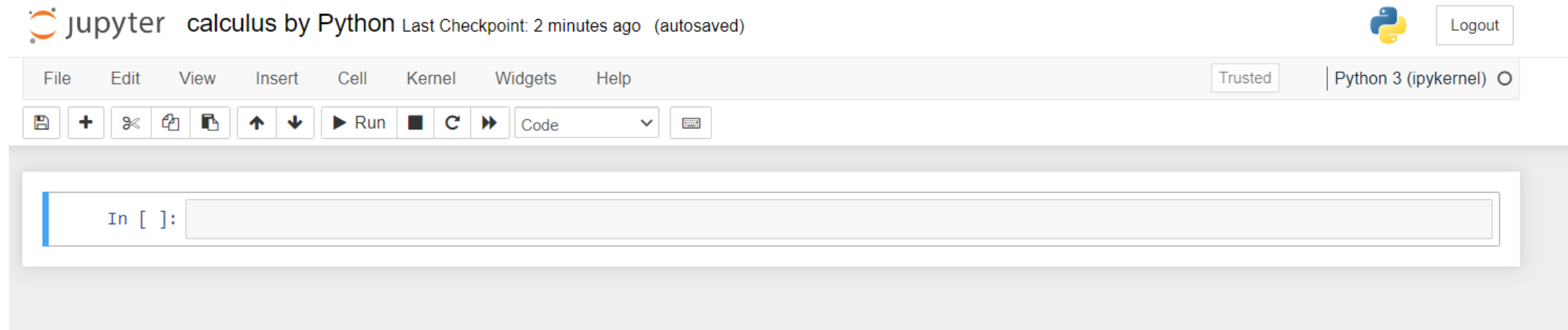
4 months ago

4 months ago

4 months ago

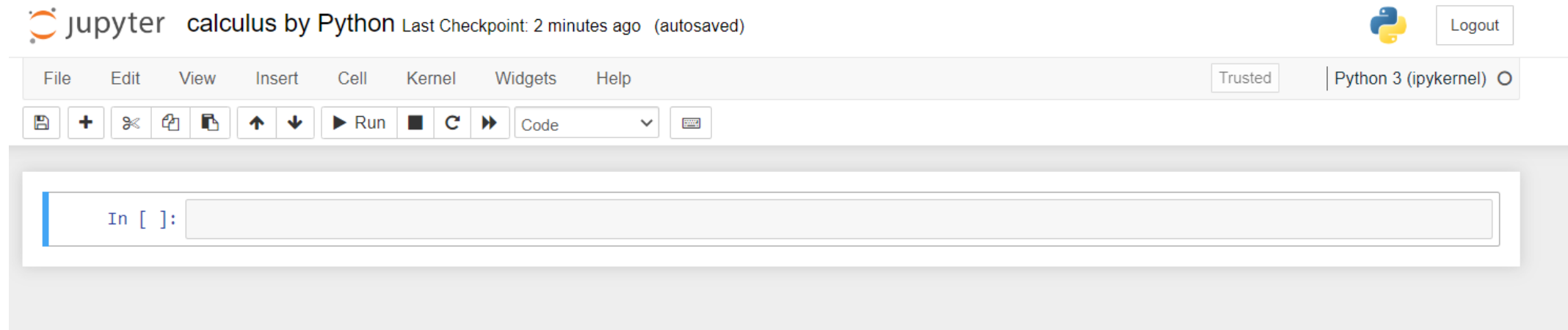
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## New Notebook



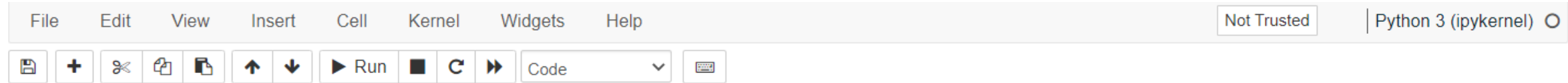
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## New Notebook



# Lecture 10

## Sympy Package



```
In [1]: from sympy import init_session
init_session()
```

IPython console for SymPy 1.10.1 (Python 3.9.12-64-bit) (ground types: python)

These commands were executed:

```
>>> from sympy import *
>>> x, y, z, t = symbols('x y z t')
>>> k, m, n = symbols('k m n', integer=True)
>>> f, g, h = symbols('f g h', cls=Function)
>>> init_printing()
```

Documentation can be found at <https://docs.sympy.org/1.10.1/>



# Lecture 10

## Sympy Package

```
In [2]: import sympy  
dir(sympy)
```

```
Out[2]: ['Abs',  
        'AccumBounds',  
        'Add',  
        'Adjoint',  
        'AlgebraicField',  
        'AlgebraicNumber',  
        'And',  
        'AppliedPredicate',  
        'Array',  
        'AssumptionsContext',  
        'Atom',  
        'AtomicExpr',  
        'BasePolynomialError',  
        'Basic',  
        'BlockDiagMatrix',  
        'BlockMatrix',  
        'CC',  
        'CRootOf',  
        'Catalan',
```



## Solving Equations and Working With Math Functions

```
In [3]: f = x**2 - 9
```

```
Out[3]:  $x^2 - 9$ 
```

```
In [ ]: f
```

```
In [4]: solve(f,x)
```

```
Out[4]: [-3, 3]
```



## Factorization

```
In [5]: factor(f)
```

```
Out[5]:  $(x - 3)(x + 3)$ 
```



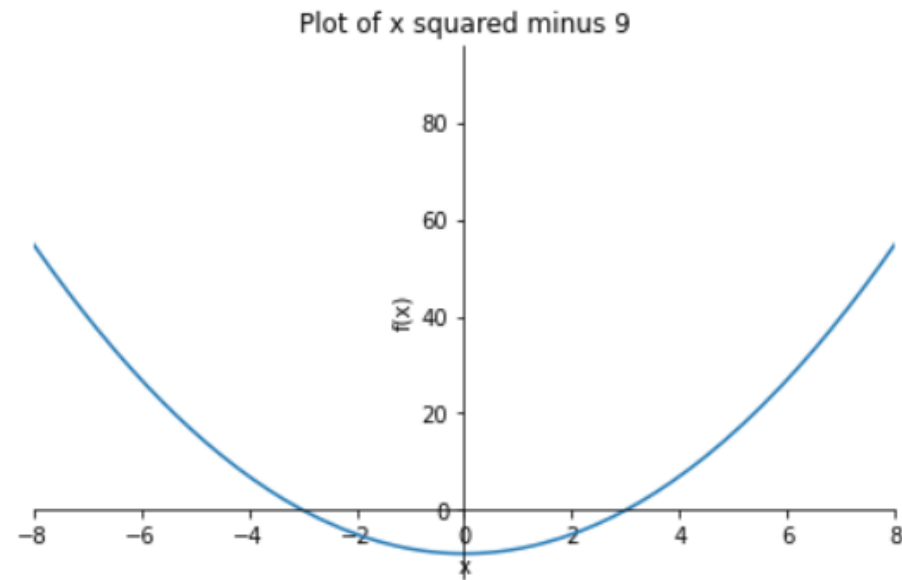
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## Graph function

### Graph function

```
In [6]: %matplotlib inline  
p = plot(f, xlim=(-8, 8), show=False,  
         title="Plot of x squared minus 9")
```

```
In [7]: p.show()
```



# Lecture 10

## Writing Root

```
In [8]: g = sqrt(x)/(1-x**2)
```

```
In [9]: g
```

```
Out[9]: 
$$\frac{\sqrt{x}}{1-x^2}$$

```



### Limits

```
In [10]: k = (x**2 - 25)/(x**2 + 2 * x - 15)
```

```
In [11]: k
```

```
Out[11]: 
$$\frac{x^2 - 25}{x^2 + 2x - 15}$$

```

```
In [12]: limit(k,x,-5)
```

```
Out[12]: 
$$\frac{5}{4}$$

```



## Differential

```
In [13]: M= 4*x**3 + sin(x) - 19
```

```
In [14]: diff(M)
```

```
Out[14]: 12x2 + cos(x)
```



# Lecture 10

## Integration by Python

### Integration

```
In [7]: V = 5 * x**3
```

```
In [8]: integrate(V)
```

```
Out[8]:  $\frac{5x^4}{4}$ 
```



### Integration

```
In [6]: N = 12 * x**2 + cos(x)
```

```
In [16]: integrate(N)
```

```
Out[16]:  $4x^3 + \sin(x)$ 
```



1- Download Python

2- Python for factorization

**factor(f)**

3- Python for graphing functions

**plot(f)**

4- Python for solving limits

**limit(f,x,3)**

5- Python for differential

**diff(f)**

6- Python for Integration

**integrate(f)**